What is claimed is:

1. A process for hardening a circumferential surface on a steel article, said process comprising: heating at least that part of the article to be hardened above the Ms temperature for the steel of the article; while the article is above the Ms temperature, heating the article along at least one small area of the circumferential surface to a temperature that transforms the steel at the surface and immediately below the surface into austenite and progressively heating the article along its circumferential surface and immediately below until the article for the full circumference of the surface possesses at least some austenitic microstructure; and transforming at least some of the austenite into martensite or bainite.

2. The process according to claim 1 wherein the transformation into martensite occurs by quenching the ring to a temperature below the Ms temperature.

3. The process according to claim 2 wherein the time that elapses between the initial heating to the temperature that transforms the steel at the surface into austenite and the quenching does not exceed the time required for the austenite of the steel to begin a transformation into bainite at the temperature to which the article is first heated and maintained.

4. The process according to claim 2 wherein the article is quenched by circulating air over it.

5. The process according to claim 1 wherein the article is progressively heated along its circumferential surface by exposing a limited area of the surface to a heat source that has the capacity to elevate the temperature of the article at the surface and immediately below the surface above the temperature at which the steel in the area

so heated will transform into austenite, and rotating the article relative to the heat source until the surface for its full circumference is exposed to the heat from heat source and the steel at the surface and immediately below acquires an austenitic microstructure.

6. The process according to claim 5 wherein the article is a race of an antifriction bearing and the surface is a raceway on that race.

7. The process according to claim 1 wherein the temperature to which the entire ring is heated exceeds the Ms temperature for the steel but is less than the lower critical temperature for the steel.

8. The process according to claim 7 wherein the transformation into bainite occurs by maintaining the temperature of the article above the Ms temperature long enough for the austenite to transform into bainite.

9. A process for hardening a circumferential surface on a steel article, said process comprising: subjecting the article to a first heating which elevates the temperature of the article to a temperature in excess of the Ms temperature for the steel of the article but less than the lower critical temperature of the steel; while the article is subjected to the first heating, subjecting the article to a second heating in which a localized area of the surface is subjected to a temperature of at least the lower critical temperature for the steel, whereby the steel at the localized area of the surface and immediately below transforms at least in part into austenite; and advancing the localized area along the circumferential surface for the full circumference of the surface so that a layer of austenite forms along the circumferential surface; thereafter quenching the

article below the Ms temperature to transform at least some of the austenite into martensite, whereby the surface is hardened.

10. The process according to claim 9 wherein the localized area is advanced along the circumferential surface in less time than is required for the austenite in the steel to begin a transformation into bainite at the temperature to which the ring is elevated in the first heating step.

11. The process according to claim 9 wherein the article is quenched generally uniformly along its circumferential surface.

12. The process according to claim 11 wherein the ring is quenched to a temperature below the Mf temperature for the steel.

13. The process according to claim 12 wherein the article is quenched by circulating air over it.

14. A process for hardening a circumferential surface on a steel article, said process comprising: heating the article until the article reaches a uniform first temperature above the Ms temperature for the article and below the lower critical temperature for the steel; while the article is maintained at the first temperature, presenting at least one small area of the circumferential surface to a focused heat source that elevates the steel along the small surface area to a temperature exceeding at least the lower critical temperature for the steel, so that the steel along the small surface area and immediately behind it transforms at least partially into austenite; effecting movement between the ring and the focused heat source so that the small surface area progresses over the entire circumferential surface, whereby the steel along the entire circumferential surface transforms at least partially into austenite; and before

any of the austenite transforms into bainite, quenching the article such that the temperature of the article along its circumferential surface drops below the Ms temperature for the steel, whereby at least some of the austenite transforms into martensite and the circumferential surface becomes harder than the remainder of the ring.

15. The process according to claim 14 wherein the steps of presenting at least one small surface area to the focused heat source and effecting movement between the ring and the focused heat source transforms substantially all of the steel along the circumferential surface into austenite.

16. The process according to claim 14 wherein the step of presenting at least one small area of the circumferential surface to a focused heat source includes subjecting multiple small areas located at equal circumferential intervals along the circumferential surface to an equal number of focused heat sources.

17. The process according to claim 16 wherein the step effecting movement between the heat source and the article includes rotating the article relative to the heat source through an angle that is substantially equivalent to the angular interval between the heat sources.

18. The process according to claim 14 wherein the article is a race of an antifriction bearing and the circumferential surface is a raceway on that race.